

REMARKS

Applicants request reconsideration of the above-identified application in light of the amendments and remarks described herein. Claims 1-43 were pending in this application, with Claims 1-19 and 38-43 being withdrawn from consideration. Claims 1-19 and 38-43 have been canceled, Claims 20 and 29 have been amended, and new Claims 44 and 45 have been added. Therefore, Claims 20-37, 44, and 45 are now pending in this application.

Claims 20-37 have been rejected under 35 U.S.C. § 103(a). In addition, the specification has been objected to due to several informalities. Applicants respectfully submit that all claims are now in condition for allowance. Accordingly, applicants request reconsideration and allowance of all claims.

Summary

Baths and methods in accordance with embodiments of the present invention are useful for the high rate electroplating of copper in a through-mask plating application and can achieve (a) a copper deposition rate of at least 2 $\mu\text{m}/\text{min}$, e.g., 4 $\mu\text{m}/\text{min}$ or faster; (b) a smooth surface morphology ($R_a < 30 \text{ nm}$) for the deposited feature; (c) a flat surface (good conformality with photoresist or other dielectric); (d) no dewetting, doming or skewing of the deposited feature; (e) no visible delamination of the deposited feature from the substrate and an adequate adhesion; (f) low dependency of morphology and flatness on feature shape, size, and open area; and (g) a thickness variation of less than 10% (3-sigma).

Withdrawal of Traversal

Applicants filed a response to the Restriction Requirement on March 21, 2007, making an election of claims with traverse. Applicants hereby withdraw the traversal and cancel the withdrawn claims.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS^{PLLC}
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

Objections to the Specification

In the Office Action, several objections to the specification have been entered due to informalities. Appropriate corrections have been made, as detailed above in the Amendments to the Specification.

Rejections of Claims 20-37 Under 35 U.S.C. § 103(a)

As mentioned above, Claims 20-37 stand rejected under 35 U.S.C. § 103(a). Specifically, Claims 20-28 stand rejected as being unpatentable over U.S. Patent No. 6,869,515, issued to Cohen (hereinafter "Cohen"), in combination with U.S. Patent No. 5,421,987, issued to Tzanavaras et al. (hereinafter "Tzanavaras"), U.S. Patent No. 6,676,823, issued to Bokisa (hereinafter "Bokisa"), and U.S. Patent No. 5,972,192, issued to Dubin et al. (hereinafter "Dubin"); Claims 20-23, 25-28, 29-32, and 34-37 stand rejected as being unpatentable over Dubin in combination with Bokisa; Claim 24 stands rejected as being unpatentable over Dubin in combination with Bokisa, Cohen, and Tzanavaras; and Claim 23 stands rejected as being unpatentable over Dubin in combination with Bokisa and further in view of Cohen and Tzanavaras.

Applicants respectfully disagree. In that regard, the Cohen reference may have an effective filing date of March 30, 2001 (assuming the U.S. provisional application filed on March 30, 2001, includes proper support for the subject matter of the U.S. nonprovisional application filed on March 29, 2002), and the Bokisa reference has an effective filing date of March 18, 2002. As described in greater detail below, applicants swear behind the effective filing dates of the Cohen and Bokisa references.

Moreover, the remaining references Tzanavaras and Dubin, whether cited alone or in combination, fail to teach or suggest all of the claim limitations of the pending claims. In that regard, Tzanavaras and Dubin, whether cited alone or in combination, fail to teach or suggest

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS^{PLLC}
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

depositing copper onto the conductive layer at a rate of at least 2 $\mu\text{m}/\text{min}$, as recited in Claims 20 and 29, and the claims depending therefrom. In contrast, Tzanavaras teaches forming an Ni-Fe alloy film at a rate of 0.28 $\mu\text{m}/\text{minute}$ (see Examples 1 and 2 of Tzanavaras). Moreover, Dubin teaches electroplating copper by employing a current density of about 5 to about 50 mA/cm^2 . Because the relationship between current density and deposition rates is about 50-55 mA/cm^2 per 1 $\mu\text{m}/\text{min}$, such a range of current density is insufficient to achieve a plating rate of at least 2 $\mu\text{m}/\text{min}$ (see Claim 7 and 8, and Examples 1-3 of Dubin). For at least these reasons, applicants respectfully request withdrawal of the rejections of the claims.

Declaration of Prior Invention Under 37 C.F.R. § 1.131

According to 37 C.F.R. § 1.131, if the applicants establish reduction to practice of the invention claimed in the application prior to the effective date of the reference, then the Patent Office should withdraw the rejection based on that reference. In pertinent part, 37 C.F.R. § 1.131(a) states:

When any claim of an application . . . is rejected, the inventor of the subject matter of the rejected claim . . . may submit an appropriate oath or declaration to establish invention of the subject matter of the rejected claim prior to the effective date of the reference . . . on which the objection is based.

Therefore, pursuant to 37 C.F.R. § 1.131, the applicants may overcome a 35 U.S.C. § 102(e) rejection by presenting a showing of facts that establish that the applicants reduced to practice the claimed invention in the United States before the effective date of the cited reference.

Attached hereto is the declaration of Bioh Kim, one of the inventors of the claimed invention, evidencing conception and actual reduction to practice of the subject matter of the rejected claims prior to the effective filing date of the Bokisa reference, March 18, 2002, and prior to the potential effective filing date of the Cohen reference, March 30, 2001. Because applicants have established that the claimed invention was conceived and actually reduced to practice prior to March 30, 2001, withdrawal of the claim rejections is respectfully requested.

LAW OFFICES OF
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New Claims

Applicants respectfully submit that new Claims 44 and 45 are also in condition for allowance and do not present any new subject matter.

CONCLUSION

In view of the foregoing amendments and remarks, applicants respectfully submit that the present application is in condition for allowance. The Examiner is invited to contact the undersigned with any remaining questions or concerns.

Respectfully submitted,

CHRISTENSEN O'CONNOR
JOHNSON KINDNESS^{PLLC}



Emily C. Peyser
Registration No. 59,844
Direct Dial No. 206.695.1634

ECP:dmg

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS^{PLLC}
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206 682.8100